

Chapter 16

Acids & Bases

Properties of Acids & Bases

Acids:

- low pH (pH < 7)
- Sour taste

Bases:

- high pH (pH > 7)
- bitter taste

Litmus *

↳ Acid = red

↳ base = blue

Phenolphthalein *

↳ Acid = colorless

↳ Base = pink

- Change colors of indicators

- Formula starts with "H"

- Neutralize Bases

- Electrolytes

- Change colors of indicators

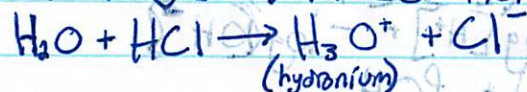
- Formula ~~contains~~ "OH"

- Neutralize Acids

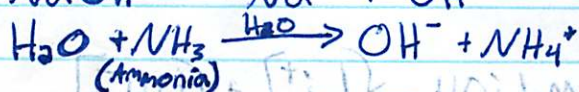
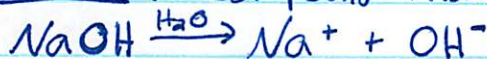
- Electrolytes

- Slimy/slippery

Acid - A compound that contains hydrogen and gives off H^+ (H_3O^+) in solution. (Ex: $HCl \xrightarrow{H_2O} H^+ + Cl^-$)

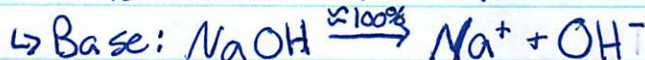
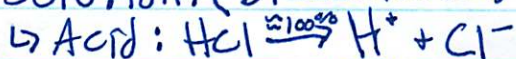


Base - A compound that creates OH^- in solution.

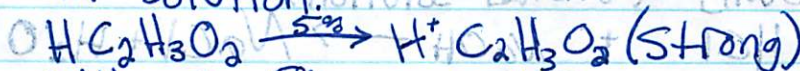


Strengths of Acids and Bases

Strong Acid or Base - Ionizes nearly completely in solution. (Dissociation)



Weak Acid or Base - Does not completely ionize in solution.

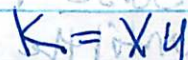
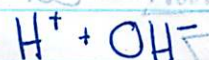


pH Scale:

0 acid 7 base 14

neutral

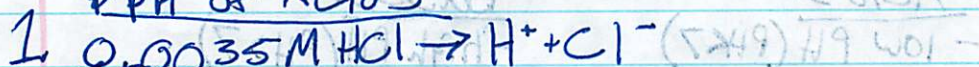
pH = Power of Hydrogen



$$-\log(1.0 \times 10^{-7} \text{M})$$

$$= 7 \text{ pH}$$

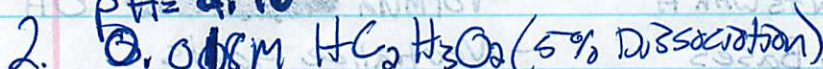
pH of Acids



$$[\text{H}^+] = 0.0035 \text{M}$$

$$\text{pH} = -\log(0.0035 \text{M})$$

$$\text{pH} = 2.46$$



$$[\text{H}^+] = 0.018 \text{M} \times 0.05$$

$$[\text{H}^+] = 0.0009 \text{M}$$

$$\text{pH} = 3.04$$

$$-\log(K_w) = -\log([\text{H}^+] \cdot [\text{OH}^-])$$

$$-\log(1 \times 10^{-14}) = -\log[\text{H}^+] + -\log[\text{OH}^-]$$

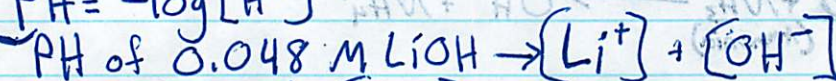
$$14 = \text{pH} + \text{pOH}$$

$$\text{pOH} = -\log[\text{OH}^-]$$

$$\text{pH} + \text{pOH} = 14$$

$$\text{pH} = -\log[\text{H}^+]$$

For a base,
find pOH,
then use
 $\text{pH} + \text{pOH} = 14$
to find pH



$$[\text{OH}^-] = 0.048 \text{M}$$

$$-\log(0.048 \text{M}) = 1.3 = \text{pOH}$$

$$\text{pH} = 14 - \text{pOH}$$

$$= 14 - 1.3$$

$$\text{pH} = 12.69$$

Titration

→ Using a solution of [known] to determine the [unknown] of another solution.



$$0.5 \text{M}$$

$$V_i 6.15 \text{mL}$$

$$V_f 12.2 \text{mL}$$

$$? \text{M}$$

$$1.0 \text{mL}$$

$$5.35 \text{mL}$$

Acid-Base Titration — combine the acid + the base until the pH = 7.

Equivalence point — point where $\text{mol H}^+ = \text{mol OH}^-$